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University of Alberta farm staff member Harold Lehman (left) assists Dr. Gerry de Boer with a BST injection

More moo for the money

Researchers study a growth hormone for increased milk production

Given the tight profit margins on today's farms, a 15% to 20% increase in production without an appreciable boost in input costs would be nothing less than phenomenal. Many industry observers, like Alan Hall, Red Deer-based Director of Alberta Agriculture's North-Central Region, say such gains can only be made through research (see Mr. Hall's report inside). There are dozens of cases proving their point, with one of the most recent being a unique milk production study based at the University of Alberta farm. Backed by an $85,000 grant from Alberta Agriculture's "Farming For The Future," University of Alberta Animal Sciences researchers Dr. John Kennelly and Dr. Gerry de Boer are hoping their project, "Effect of growth hormone and frequency of feeding on milk production and milk composition in dairy cows," will reveal milk production increases of 15% to 20%. And, says Dr. de Boer, a 40% increase with a well-managed herd is "entirely possible."

Surprisingly, the hormone that is involved in their research, *bovine somatotropin (BST)*, is found naturally in every cow in Alberta and beyond. It's a protein produced in the pituitary gland. Its biological function is to stimulate lactation. And even though it's popularly called a "growth" hormone, it does not make cows larger—just better milk producers. Like other proteins, BST is composed of amino acids. In laboratory conditions, scientists can isolate these amino acids to make vast quantitites of BST synthetically.

And it's a product that has the dairy industry buzzing. Interest in BST is running high because of its effect on lactation, its safety for consumers and the potential to reproduce large amounts of it inexpensively. That interest was strengthened by the impressive results at Cornell University showing that cows injected daily with small quantities of BST during the last two-thirds of their lactation increased their milk production by up to 41% (i.e., 25% more milk over the entire lactating period). Furthermore, they showed no side effects regarding body condition, health and reproductive performance, and their milk composition (fat, protein and lactose) went unchanged.

Canadian scientists like Dr. Kennelly and Dr. de Boer are part of an international effort to find out more about BST. Many areas still need to be assesed, such as:

- the optimum injection dose;
- the acceptance by producers, consumers, and processors;
- the effects on farm revenue and the price of dairy products;
- the response of cows under current commercial feeding conditions (BST results in greater feed consumption, since the cows are producing more milk); and
- the effects on purebred lines and sire genetic potential.

According to Dr. de Boer, daily 25-milligram injections of BST on 100 cows being maintained for the project (at both the University farm and at the University

(continued on back page)

INSIDE:
The spores that kill 'hoppers

A plague on 'hoppers

The spores that devour an Alberta pest

Grasshoppers have long been a scourge of Alberta farmers, eating crops and feeding on valuable pasture. Producers have employed everything from arsenic to costly chemical sprays to try to curb the infestation. But Lethbridge-based research scientist Dr. Dan Johnson, one of the West's foremost authorities on grasshoppers, has a different solution. With the help of a $77,000 Alberta Agriculture "Farming For The Future" research grant, he's spent the past three years developing and testing an effective and inexpensive breakthrough in hopper control called *Nosema locustae*, a protozoan insect disease which infects only grasshoppers and locusts and is environmentally safe.

The spores of *Nosema* are clinically cultured within the bodies of the 'hoppers themselves, by researchers who expose the insects to immature microscopic spores in the lab. Soon the hoppers' health declines, but they're kept alive long enough for the spores to mature. Finally, the insects are allowed to die, at which time their carcasses are pulverized in a grinder.

The *Nosema* spores are then extracted and purified. Typically, the spores are sprinkled on molasses-soaked bran (a grasshopper favourite), broadcast over fields and roadsides by airplane, and eaten by the hungry insects. Like their laboratory cultured counterparts, these spores germinate internally, all the while feeding off the hopper's body fat and slowly killing it.

Symptoms of infection, which appear after two to three weeks, include reduced feeding, low reproduction and death within 14–20 days. "It is such a cheap method of controlling hoppers," Dr. Johnson explains, "because it only costs about $1 per acre to produce." Indeed, the average hopper produces one billion spores, enough to treat an acre of land.

Dr. John Henry, a Montana agricultural scientist, first began working on *Nosema* in the early 1960s. After he tested it in the western U.S., South America and Africa, his work was picked up by researchers at the University of Saskatchewan. Recently, that institution received a $350,000 federal grant for further research to provide toxicological data supporting the use of *Nosema*.

It was Dr. Johnson's initiative to bring *Nosema* testing to Alberta in 1983. He had started this research as a doctoral candidate in insect ecology at the University of British Columbia, and began testing the concept by applying *Nosema* to grassy roadsides, trying to create an epidemic among resident hoppers.

This year, roadside testing offered some fascinating results. The *Nosema* reduced grasshoppers by 30% after four days, thanks to a higher than predicted

Dr. D the hu

Measuring moisture by computer

A more scientific way of assessing grain dampness

Moisture can be a grain producer's best friend or worst enemy. It's welcomed before and after spring planting, but goes unwanted where grain bins are concerned. If moisture is too high, it creates a breeding ground for micro-organisms and insects. But in Tees, 40 miles east of Red Deer, grain producer David Crompton and his wife Jenny have developed an affordable, computer-based temperature monitoring system, with the help of $9,220 from Farming For The Future's On-Farm Demonstration research program. They say their project is a significant step forward in preventing spoilage, and will be important for maximizing returns.

Farmers measure or estimate the moisture content of their grain when they store it. If the moisture content is less than 14% the grain will not spoil. However, if some of the grain contains more than 14% moisture, serious problems can occur.

Mr. Crompton decided there was a need for a more accurate and scientific temperature monitoring method to tell producers on a daily basis how secure their stored grain was. So with the assistance of Q-Trons Industrial Electronics of Calgary, he developed a unique system. It centres around a portable sensor, using multi-stage probes suspended from the top to the bottom of the bin (at an estimated cost of $200 per bin). The system also included a computer, costing about $1,000, and a $700 printer and disc drive unit.

The major thrust of this project, Mr. Crompton says, will be to use the computer to follow the cooling gradient at the "drying front" of an air drying system. The stored grain is dried by fans blowing warm air through the bin. As the air passes through, it collects moisture from the grain and is blown out of the bin.

The computer will aid the farmer in measuring how quickly the percentage of dry grain in the bin increases. At regular intervals the computer will send a coded signal to transmitters affixed inside each bin. The activated transmitters, powered by rechargeable nine-volt batteries, relay back a signal with a frequency indicating the sensor's temperature. The computer processes this information, updates all readings in its memory, and displays or prints the data on command.

The producer receives the specific location and number of the sensor providing the data. Temperature readings can be given in either Celsius or Farenheit. (Limits for temperature measuring fall within –40 degrees C and 70 degrees C.) Should the moisture exceed a predetermined level, about 14%, an alarm is activated.

Mr. Crompton began his experiment by hooking up the temperature sensors to two bins. "Weather, grain moisture, humidity outside the bin and fan performance data were recorded daily," he says, "in order to get a clearer picture of the actual shape of the drying front as it moved through the grain."

The effectiveness of the Crompton project has been very encouraging, says Robert Borg, regional engineer for Alberta Agriculture in Red Deer, and demonstrates the increasing importance of the role of computers on the farm. Mr. Borg says the project has implications for the

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germination of the spores. "We were shocked," exclaims Dr. Johnson. Further test results from last summer will determine how effective the spread of the disease will be from generation to generation.

Producers will not be able to solve all of their grasshopper problems once *Nosema* becomes commercially available in the next few years. Grasshopper infestion of cereal crops will still require the usual insecticides, some of which are eight times more expensive than *Nosema*, because of their ability to kill hoppers instantly. However, *Nosema* may solve some problems in controlling hoppers on both range and pasture land where the pests can be devastating. "Our biggest problem may be that farmers' expectations will be too high," Dr. Johnson concludes. "*Nosema* won't make grasshopper infestation go away, but it will control the outbreak and reduce its severity significantly."

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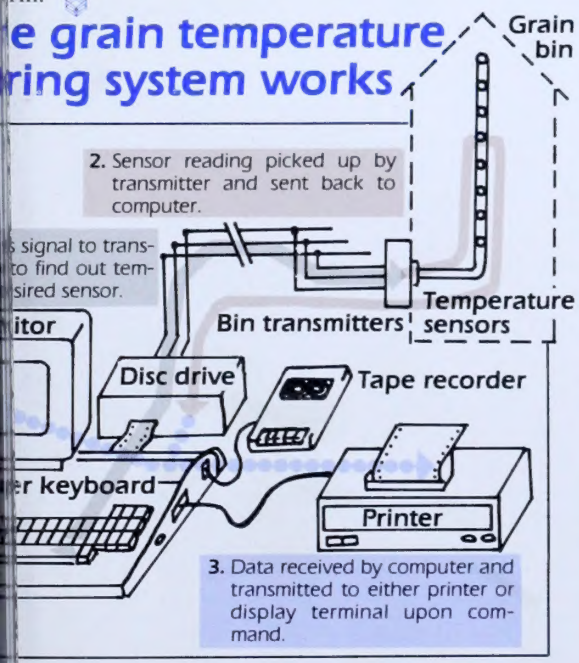
e grain temperature ring system works


Grain bin
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Bin transmitters
Temperature sensors
Disc drive
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r keyboard
Printer
3. Data received by computer and transmitted to either printer or display terminal upon command.

FARMING FOR THE FUTURE

CANADIANA
OCT 24 1986

by Alan Hall
Regional Director
North-Central Region

The agricultural industry has become a victim of its own success. Historically, by producing more, individual producers' profits were increased. When the industry as a whole adopted new technology, a surplus capacity that pressured prices downward and eroded the net returns emerged. This is evident in the huge surpluses, accompanying low prices and excess production capacity now seen in the global economy.

In the last 15 years, agriculture has moved from the era of "low volume, high margin" to an industry based on "high volume, low margin." Our competitors are in the fast lane of technological change. Many of their societies provide additional financial support that encourages productivity at uneconomic levels. All combined, these factors present an enormous challenge to the long-term well-being of our agriculture industry.

Production controls and false economies do not provide long-term stability and an opportunity for growth. Survival at profit levels sufficient to ensure long-term strength will require continual development of new cost reducing technologies. Research can make major contributions to advances in agricultural technology.

Perhaps even more critical is the effective and speedy transfer of new technology to commercial agriculture. New information, new methods and new technologies all assist by reducing the risk, diversifying end products, identifying new efficiencies or reducing input costs per unit of production. The scours vaccine recently developed by VIDO, the new crop varieties and the use of canola meal in the feed industry are some examples. These and many other success stories attest to the value of research and its importance to agriculture.

The On-Farm Demonstration Program of "Farming For The Future" is being used extensively to assist in technology transfer. The strength of the program is its flexibility and "partnership approach" by producers, agri-business, extension services and reseachers.

I believe this program is making major contributions to industry profitability. A quick look at the past reveals a dramatic upturn in profitable pasture management, improved intensive/integrated crop management and the utilization of triticale. And in this issue, *Research Report* highlights a computerized watchdog for grain bin moisture, an On-Farm Demonstration project from the North-Central Region.

But new technologies require patience. Until we learn how to manage them, they're high risk endeavours that need time for perfecting. The On-Farm Demonstration Program provides the operating capital, scientific and technical expertise and the hard work and experience of producers and agri-business. It helps work a new technology through the process of commercial application.

In the future, our competition in the marketplace will be even tougher than today. To meet the challenge, we must continue to seek and apply any advantages we can find. We must strike a balance between getting trapped in the "security" of present technology, and seeing new technology as the recipe for instant success. The On-Farm Demonstration Program will strike that delicate balance.

The voice of the people

Research Report readers respond

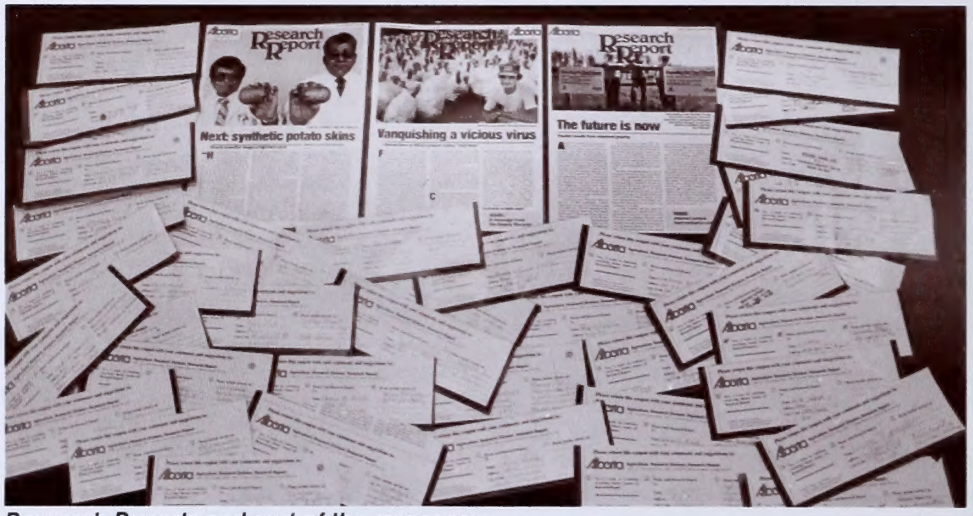
The acid test of any publication is its readers' response. A receptive audience is both interested and participatory, contributing positively to the further development of the particular information vehicle. So Dr. Art Olson, Alberta Agriculture's Assistant Deputy Minister of Research and Resource Development, was understandably delighted with the reaction the Department has received from farmers and researchers who receive Alberta Agriculture's newly-created *Research Report*. Acting on a coupon query in the first issue of the publication, producers have sent hundreds of requests to Dr. Olson's office for future issues of *Research Report* for them and their friends. "Frankly," he says, "we were overwhelmed by the volume and quality of the responses. We couldn't be more pleased with the level of interest in agricultural research being shown by producers in this province."

The back cover of *Research Report*'s first edition featured a clip-out coupon asking recipients to indicate their willingness to continue receiving the publication. As well, they were invited to recommend others who would be interested in receiving *Research Report*. And finally, respondents were given the option of proposing topics about which they would like *Research Report* to publish articles.

That proved to be a popular feature. "Readers' response was active and acute," says Dr. Olson. Their suggestions included:

- new disease-resistant varieties of soft white wheat, from Peter Hooge of Taber;
- agricultural chemicals and financial management, from Gerald Oosterhuis of Bow Island;
- weed control measures, from Archie Bell of Chauvin;
- livestock diseases and Canada thistle, from Raymond Pearson of Manyberries;
- pedigree seed varieties, from Orville Zwack of Daysland;
- disease control and the timing of immunization procedures for sows, from Osborne A. Clark of Erskine;
- northern farming developments, from Marie Morrill of Hondo;
- specialty crops, from Golka Farming Co. of Hardisty;
- irrigation farming, from John Vanden Dool of Picture Butte;
- brush and poplar control on pasture land, from Clifford D. Cameron of Hughenden;
- dairy farming and game ranching, from Henry M. Kozak of New Sarepta;
- market gardening and growing fruit trees in northern Alberta, from Gerry Cadieux of Lac La Biche;
- weather forecasting procedures and research into the cheaper transportation of bulk agricultural products, from Gordon Reid of Cremona;
- zero tillage farming, from Howard and Marijke Stanley of Clandonald; and
- farm building design and technology, from William R. Hagedorn of Mossleigh.

Some respondents like Robert Hornbrook of Bonnyville suggested all aspects of farm research, and Roy N. Fraser of Provost recommends "anything new that has to do with better farming." H.J. Haugen of Lougheed is "looking forward to learning and reading new ideas" in *Research Report*, and D. Major of Consort says it's "good to see circulation of current topics." Peggy MacDonald of the *Westlock News* says "all articles will be appreciated."



Research Reports and part of the responses

- biotechnology advances and use of computer software in implements and power units, from Arden Haugan of Orion;
- beef cattle research, from L.T. Jones of Fairview;
- animal nutrition, from the Canadian Hereford Digest in Calgary;
- higher yielding grain and oilseed varieties, from Ken Wasmuth of Wainwright;
- anything new pertaining to cropping of barley and canola, from Merden Farms Ltd. of Blackfalds;
- heat exchangers and ventilation for livestock buildings, from John and Debbie Devries of Vauxhall;

Dr. Olson promises these comments will be heeded. "Many of these topics will be appearing in future issues of *Research Report*," says Dr. Olson. "In fact, several of the stories in this month's issue resulted from readers' responses. I would like to thank all those who took the time to write, and all those who did not, but enjoy reading *Research Report*."

Growth hormone . . . continued from page one

of British Columbia Research Farm on Vancouver Island) have added another five kilograms to the 28 kilograms of milk normally produced each day by a lactating cow. With dairy farmers getting about 40 cents a litre for their milk, that means an extra $2 per day per cow. And while he still doesn't know what the cost to producers will be, Dr. de Boer is certain that the herd's increased feed intake and the cost of the BST itself will be appreciably less than $2 per cow per day. In fact, he expects BST to increase net efficiency by 16%.

Still, despite the seemingly great potential of this hormone, Dr. de Boer is maintaining a down-to-earth attitude. "There is nothing magical about somatotrophin," he says. "Benefit accrues in that the maintenance requirement of cows is spread over more milk production, and that dairy farmers may handle fewer animals and produce the same amount of milk."